International Journal of Engineering & Technology, 7 (3.10) (2018) 50-53

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Dynamic Analysis and Structure Soil Interaction of Retaining Wall Using ETABS

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Abstract

Retaining systems are widely used international for serving numerous functions in structures and infrastructures. The seismic response of forms of walls that assist a single soil layer has been examined with the aid of some of researchers in the past. The design of preserving partitions in seismic areas poses a complex problem. The conventional layout method usually contains calculation of an element of safety in opposition to sliding, overturning and bearing ability failure. Retaining partitions have suffered damages under beyond earthquakes. Typically the analyses do not bear in mind the retained soil's interplay with the wall, which takes location at some point of dynamic conditions. The situations of separation of wall (at some point of interactions) over again trade the dynamic traits of the assumed wall-soil interplay that needs to be addressed. Our study conducts the retaining wall beneath static in addition to seismic situations about above components.

Keywords: *Dynamic Analysis, Soil Interaction, Retaining wall and ETABS*

1. Introduction

Seismic damage to gravity wall results from basis failure due to excessive plastic floor deformation. accordingly the harm of a wall is especially associated with the motion and failure brought approximately through excessive seismic earth strain. but, the to be had models within the literature were now not without a doubt completed an excellent manner to are expecting the seismic response of the wall all through earthquake.

2. Methodology

Fig.1 shows the methodology of this study.

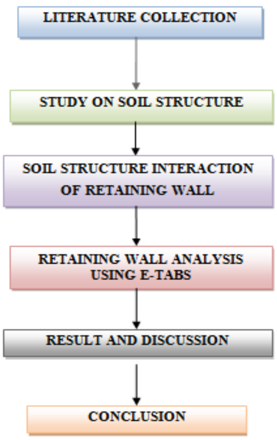

Fig.1: Methodology

3. Retaining Wall

Techniques for comparing earth pressures on maintaining walls and design techniques are summarized herein for cohesion much less backfill materials, which must be used each time viable. Earth keeping structures are designed to triumph over significant in ground tiers to offer both a sloping or flat floor at the retained face. Earth maintaining structures can help provision of feasible vicinity for extraordinary civil engineering systems to be built.

4. Earthquake

4.1. Basic Aspects of Seismic Design

Designing homes to act elastically at some point of earthquakes without harm can also render the mission economically unviable. Accordingly, it may be vital for the structure to undergo harm and thereby dissipate the electricity input to it all through the earthquake.

- Slight shaking with minor damage to structural elements, and a few damage to non-structural factors; and
- Thus, seismic layout balances reduced price and ideal harm, to make the task viable. This cautious balance is arrived primarily based on giant research and detailed put up-earthquake damage assessment research.
- A wealth of this record is translated into specific seismic layout provisions. In assessment, structural damage isn't acceptable beneath layout wind forces. Because of this, layout in opposition to earthquake results is referred to as

earthquake-resistant layout and now not earthquake-proof design.

4.2. Earthquake Resistant Structures - Factors

- All elements consisting of partitions and the roof must be tied collectively on the way to act as an included unit all through earthquake shaking.
- The constructing have to be linked to an amazing quality and the earth moist soil have to be avoided and the inspiration need to be nicely tied collectively as nicely tied to the wall wherein the soft soils strengthening must be provided.

5. Analysis Software

5.1. E-Tabs

ETABS is a complicated, however smooth to apply, unique motive evaluation and layout application superior specifically for constructing structures.

6. Analysis Results

6.1. Structure Data

This area presents model geometry statistics, inclusive of items consisting of story levels, point coordinates, and detail connectivity. Fig.2 suggests the summary report.

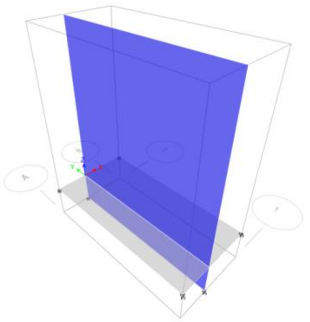

Fig.2: Summary report

6.1.1. Storey Data

Table 1 shows the storey data.

Table 1: Storey data

Name	Height mm	Elevation mm	Master Story	Similar To	Splice Story
Story2	5000	5000	No	None	No
Story1	1000	0	No	None	No
Base	0	-1000	No	None	No

6.2. Loads

6.2.1. Load Patterns

Table 2 shows the load patterns.

Table 2: Load Patterns

Name	Type	Self Weight Multiplier
1 LOAD CASE 1	Dead	1.5
2 LOAD CASE 2	Reducible Live	0

6.2.2. Load cases

Table 3 shows the load cases – summary.

Table 3: Load cases – summary

Name	Type
Dead	Linear Static
Live	Linear Static
1 LOAD CASE 1	Linear Static
2 LOAD CASE 2	Linear Static

7. Analysis Results

7.1. Structure Results

Table 4 shows the base reactions.

Table 4: Base Reactions

Load Case/Combo	FX kN	FY kN	FZ kN	MX kN-m	MY kN-m	MZ kN-m	X m	Y m	Z m
Dead	0	0	0	0	0	0	0	0	-1
Live	0	0	0	0	0	0	0	0	-1
1 LOAD CASE 1	0	0	305.2171	-763.0428	-22.4424	0	0	0	-1
2 LOAD CASE 2	-175.7813	0	37.5	-93.75	108.5938	-439.4533	0	0	-1

Table 5 shows the centres of mass and rigidity.

Table 5: Centres of mass and rigidity

Story	Diaphragm	Mass X kg	Mass Y kg	XCM m	YCM m	Cumulative X kg	Cumulative Y kg	XCCM m	YCCM m
Story1	D1	13425.82	13425.82	0.1136	-2.5	13425.82	13425.82	0.1136	-2.5

7.2. Modal Results

Table 6 shows the model periods and frequencies.

Table 6: Model periods and frequencies

Case	Mode	Period sec	Frequency cyc/sec	Circular Frequency rad/sec	Eigenvalue rad²/sec²
Modal	1	11682.376	8.56E-05	0.0005	0
Modal	2	7012.451	0.0001426	0.0009	8.028E-07
Modal	3	101.282	0.01	0.062	0.0038
Modal	4	26.628	0.038	0.236	0.0557

Table 7 shows the mass ratios (part 1 of 2).

Table 7: Mass ratios (Part 1 of 2)

Case	Mode	Period sec	UX	UY	UZ	Sum UX	Sum UY	Sum UZ
Modal	1	11682.376	1	0	0	1	0	0
Modal	2	7012.451	0	0	0	1	0	0
Modal	3	101.282	0	0.0298	0	1	0.0298	0
Modal	4	26.628	0	0.9702	0	1	1	0

Table 8 shows the mass ratios (part 2 of 2).

Table 8: Mass ratios (Part 2 of 2)

Case	Mode	RX	RY	RZ	Sum RX	Sum RY	Sum RZ
Modal	1	0	1	0	0	1	0
Modal	2	0	0	0.9991	0	1	0.9991
Modal	3	0.0298	0	2.58E-05	0.0298	1	0.9992
Modal	4	0.9702	0	0.0008	1	1	1

Table 9 shows the modal load participation ratios.

Table 9: Modal load participation ratios

Case	Item Type	Item	Static %	Dynamic %
Modal	Acceleration	UX	100	100
Modal	Acceleration	UY	243078219	100
Modal	Acceleration	UZ	0	0

Table 10 shows the model direction factors.

Table 10: Model direction factors

Case	Mode	Period sec	UX	UY	UZ	RZ
Modal	1	11682.376	1	0	0	0
Modal	2	7012.451	0	0	0	1
Modal	3	101.282	0	1	0	0
Modal	4	26.628	0	1	0	0

Fig.3 shows the deformation.

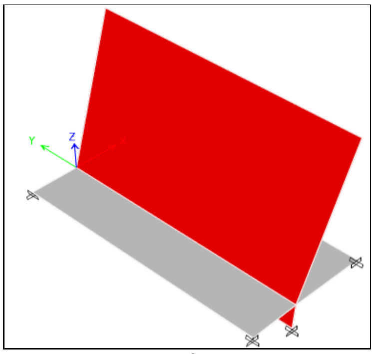

Fig.3: Deformation

Fig.4 shows the stress diagram.

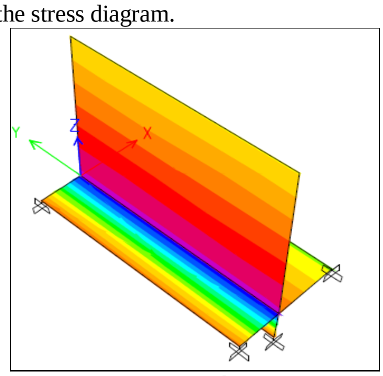

Fig.4: Stress diagram

7.3. Response Spectrum Analysis

Fig.5 shows the spectral acceleration.

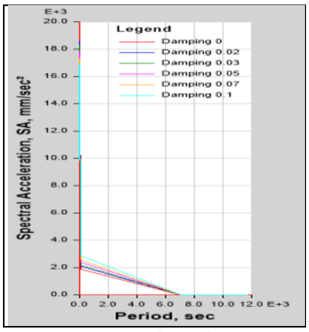

Fig.5: Spectral acceleration

Fig.6 shows the spectral velocity.

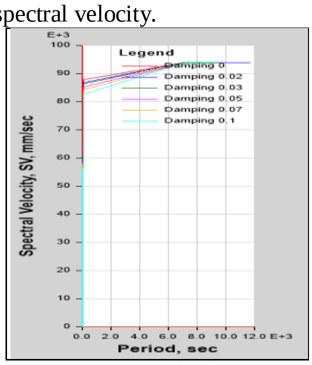

Fig.6: Spectral velocity

Fig.7 shows the time history plot.

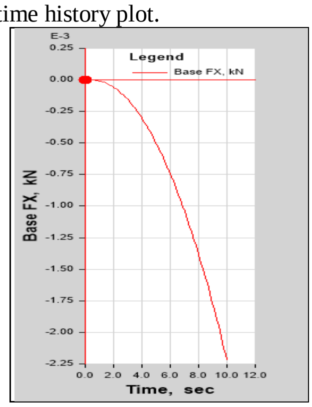

Fig.7: Time history plot

8. Conclusion

In the present study at, the usage of two - dimensional numerical simulations, they have an effect on of the wall compliance, the form of the wall-retained soil interface, and the relative peak of the structure at the dynamic misery and response of the latter is tested. During a seismic occasion it is glaring that the dynamic response of each element of this complex tool. Regardless of the fact that there exist many open problems to be resolved,. This mission based on have a look at of earth quake analysis and soil interplay of keeping wall the usage of E-Tabs.

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